Principal Characters of the Coryphodontidæ. Characters of the Odontornithes, with Notice of a New Allied Genus. Notice of a New and Gigantic Dinosaur. By O. C. Marsh. (From the American Journal of Science and Arts, xiv. July, 1877.) 8vo, pp. 8, 2 plates.

Zur Entwickelungsgeschichte der Dekapoden. Von Paul Mayer. (Abdruck aus der Jenaische Zeitschrift, für Naturwissenschaft, Bd. xi.) 8vo, pp. 81, 3 plates.

On the California Species of Fusus. 8vo, pp. 5. Preliminary Descriptions of New Species of Mollusks from the Northwest Coast of America. 8vo, pp. 6. By W. H. Dall. (From the Proceedings of the California Academy of Science, March 19, 1877.)

On the Brain of Procamelus occidentalis. By E. D. Cope. (From the Proceedings of the American Philosophical Society.) Published June 15, 1877. 8vo, pp. 52, with a plate.

On the Vertebrata of the Bone Bed in Eastern Illinois. By E. D. Cope. (From the Proceedings of the American Philosopical Society.) Published June 20, 1877. 8vo, pp. 11.

Ueber den Ursprung der Blumen. Von Dr. Hermann Müller. (Aus Kosmos.) 1877. 8vo, pp. 14.

Ueber Bau und Entwickelung des Stachels der Ameisen. Von Dr. H. Dewitz. (Siebold und Kölliker's Zeitschrift, xxviii.)

The Tailed Amphibians, including the Cæcilians. A Thesis: Presented to the Faculty of Michigan University. By W. H. Smith. Detroit. 1877. 12mo, pp. 158.

Tribes of the Extreme Northwest. By W. H. Dall. (Department of the Interior. U. S. Geographical and Geological Survey of the Rocky Mountain Region. J. W. Powell, Geologist in Charge. Part 1.) 1877. 4vo, pp. 106, with a map.

History of the American Bison, Bison Americanus. By J. A. Allen. (Extracted from the Ninth Annual Report of the U. S. Geological Survey. F. V. Hayden in charge.) Washington. 1877. 8vo, pp. 587.

Ethnography and Philology of the Hidatsa Indians. By Washington Matthews. (Miscellaneous Publications, No. 7, U. S. Geological and Geographical Survey. F. V. Hayden in charge.) Washington. 1877.

GENERAL NOTES.

BOTANY.[1]

Illustrations of North American Ferns. — It gives us sincere pleasure to learn that it is proposed by Mr. S. E. Cassino to publish an illustrated popular work on our ferns. The announcement is made that the drawings will be from sketches by Mr. J. H. Emerton, and that the text will be furnished by Professor Eaton. The latter is a recognized authority thoroughly familiar with American ferns; Mr. Emerton's skill as a draughtsman is well known to our readers. The plates are to be in color, and the work is promised at an exceedingly low price.

Acer dasycarpum. In 1843, Mr. Emerson measured a tree of this species, growing in the town of Stockbridge, Mass., when at three feet from the ground, it girted twelve feet. In October, 1876, the same tree was measured by Mr W. R. Robeson, who reports that its circumference at the same height, was then fifteen feet and nine inches, showing an annual average increase of circumference during the last thirty-three years of a little over 1.36 inches. — C. S. Sargent.

[1] Conducted by Prof. G. L. Goodale.

OBSERVATIONS ON SILPHIUM LACINIATUM, THE SO-CALLED COMPASS PLANT.[1] — For the past six or eight years there has been little doubt of the curious polarity of the root and stem-leaves of the large coarse plant known throughout the prairie regions by the name of the compass plant. It appears, however, that few accurate measurements of the bearings of these leaves have been made. So that while they are now considered as pointing more or less to the north, but little is known as to how nearly they arrange themselves upon the meridian. In order to contribute to a better knowledge of this matter, I have for several years been making observations, the results of which I herewith transmit: —

TABLE I.

Bearings of the leaves of fourteen small plants, many of which had but one leaf each: —

North	1°	30′	East.	North	4°	30′	West.
"	1°	45′	"	"	7°	30′	"
"	1°	45′	"	"	8°	30′	"
"	5°	30′	"	"	9°	15′	"
"	6°	0′	"	"	13°	30′	"
"	6°	30′	"	"	22°	15′	"
"	8°	0′	"	"	25°	0′	"
"	21°	30′	"	"	29°	30′	"
"	82°	30′	"	"	34°	0′	"
				"	34°	0′	"
				"	37°	0′	"
				"	61°	45′	"
				"	71°	45′	"

Fifty per cent., it will be observed, deviated less than ten degrees, and eighty-six per cent. less than forty-five degrees from the meridian.

TABLE II.

Bearings of thirteen leaves, all of which grew on one large plant: —

North	0°	30′	East.	North	0°	30′	West.
"	0°	45′	"	"	1°	15′	"
"	3°	30′	"	"	35°	30′	"
"	3°	45′	"	"	88°	0′	"
"	3°	45′	"				
"	10°	30′	"				
"	17°	30′	"				
"	36°	0′	"				
"	89°	30′	"				

Fifty-four per cent. of these leaves deviated less than four degrees from the meridian, and eighty-five per cent. less than forty-five degrees.

TABLE III.

Bearings of the leaves of a medium sized plant: —

North	1°	0′	East.	North	0°	15′	West.
"	1°	30′	"	"	0°	30′	"
				"	0°	30′	"
				"	20°	0′	"
				"	56°	0′	"

[1] See an article on this subject in THE AMERICAN NATURALIST for March, 1871, where may be found also references to other papers. An article appeared some years since in the American Agriculturist, and another recently in Nature, in which good cuts of the compass plant were given.

Of these seventy-one per cent. deviated less than two degrees, and eighty-five per cent. less than forty-five degrees from the meridian.

TABLE IV.

Bearings of the leaves of a large plant: —

North	0°	0′	East.	North	17°	0′	West.
"	2°	30′	"	"	32°	0′	"
"	3°	0′	"	"	35°	0′	"
"	11°	0′	"				
"	13°	0′	"				
"	16°	15′	"				
"	40°	15′	"				

It will be observed that, with a good deal of variation in the bearings, none of the leaves diverge as far from the meridian as forty-five degrees.

TABLE V.

Bearings of the leaves of another large plant: —

North	5°	0′	East.	North	2°	30′	West.
"	9°	30′	"	"	3°	45′	"
"	12°	45′	"	"	4°	45′	"
"	14°	30′	"	"	23°	30′	"
"	14°	30′	"	"	45°	30′	"
"	20°	30′	"				
"	21°	0′	"				
"	28°	30′	"				
"	29°	30′	"				
"	31°	45′	"				

Thirty-three per cent. deviated less than ten degrees, and ninety-three per cent. less than forty-five degrees from the meridian.

TABLE VI.

Bearings of the leaves of ten plants, large and small: —

North	1°	45′	East.	North	6°	30′	West.
"	1°	45′	"	"	7°	45′	"
"	3°	30′	"	"	12°	15′	"
"	4°	15′	"	"	13°	30′	"
"	6°	45′	"	"	21°	20′	"
"	7°	0′	"	"	23°	30′	"
"	7°	45′	"	"	30°	0′	"
"	12°	45′	"	"	33°	30′	"
"	16°	0′	"	"	43°	0′	"
"	18°	45′	"				
"	37°	45′	"				
"	39°	0′	"				
"	41°	15′	"				
"	42°	15′	"				
"	42°	30′	"				
"	46°	0′	"				
"	52°	15′	"				

Thirty-four and one half per cent. of these leaves deviated less than ten degrees from the meridian, and ninety-two per cent. less than forty-five degrees.

Taking the bearings of all the leaves observed (ninety-three in all), we find that about thirty per cent. did not vary more than five degrees, forty-two per cent. not more than ten degrees, and ninety per cent. not more than forty-five degrees from the meridian.

If now we tabulate the bearings so as to indicate how many lie between 0 and 5° east, between 5° and 10° east, and so on, we have —

TABLE VII.

From	0	to	5°	East,	18	leaves.	From	0	to	5°	West,	9 leaves.
"	5°	to	10°	"	8	"	"	5°	to	10°	"	5 "
"	10°	to	15°	"	7	"	"	10°	to	15°	"	3 "
"	15°	to	20°	"	4	"	"	15°	to	20°	"	2 "
"	20°	to	25°	"	3	"	"	20°	to	25°	"	5 "
"	25°	to	30°	"	2	"	"	25°	to	30°	"	2 "
"	30°	to	35°	"	1	"	"	30°	to	35°	"	5 "
"	35°	to	40°	"	3	"	"	35°	to	40°	"	2 "
"	40°	to	45°	"	4	"	"	40°	to	45°	"	1 "
"	45°	to	50°	"	1	"	"	45°	to	50°	"	1 "
"	50°	to	55°	"	1	"	"	50°	to	55°	"	0 "
"	55°	to	60°	"	0	"	"	55°	to	60°	"	1 "
"	60°	to	65°	"	0	"	"	60°	to	65°	"	1 "
"	65°	to	70°	"	0	"	"	65°	to	70°	"	0 "
"	70°	to	75°	"	0	"	"	70°	to	75°	"	1 "
"	75°	to	80°	"	0	"	"	75°	to	80°	"	0 "
"	80°	to	85°	"	1	"	"	80°	to	85°	"	0 "
"	85°	to	90°	"	1	"	"	85°	to	90°	"	1 "
Total leaves East, 54.							Total leaves West, 39.					

In one case (Table VI. in part) of twenty-eight leaves examined, all but three had rotated upon their petioles in assuming their positions, that is, they *twisted* their petioles; of these twenty rotated with the sun, and five against it. Of the three remaining leaves, two rotated their two half blades upon their midribs, so that *both edges* tended to point towards the north; the remaining leaf did not show any evidence of rotation in either direction, and its bearing was seven degrees east of north.

In another case (the second leaf in Table I.) a leaf was found to have rotated through at least 270° of arc to reach its final position. Originally it stood with one edge nearly due east, and the other west; the western edge then rotated northward, passed the zero point and swung away round to the south, passing 1°45′ beyond that point. This rotation was all confined to the petiole.

How to account for this evident turning has been, and still is a puzzling thing. In order to see whether there was any diurnal rotation, or turning, such as is observed in the sunflower, I carefully set stakes in line with several leaves having quite different bearings, and watched them closely for about a week, but failed to discover the least tendency to any such motion.

Dr. Gray, I believe, first made the suggestion that the structure of the leaf must have something to do with their so-called "polarity," and made some examinations as to the number of stomata upon the two surfaces. I have made many examinations by the aid of the microscope, and have determined that in the central part of a full grown leaf the stomata are at the rate of 52,700 to each square inch of upper surface, and 56,300 to each square inch of lower surface. In this calculation I made no account of the veins, which apparently occupy an equal area on both surfaces. They probably take up fully one half the surface, and they are destitute of stomata.

Five years ago I examined the two surfaces of quite young leaves,

and after many observations found that the relative numbers were as ninety stomata to the upper, and eighty-seven to the lower surface. A year later the average of three observations on older leaves gave as the relative numbers, sixty-two for the upper, and sixty-nine for the lower surface. Again, in 1874, averages of carefully made observations upon young leaves gave as relative numbers forty-nine for the upper surface, and fifty-nine for the lower. Observations made at the same time upon old leaves gave the numbers fifty-seven for the upper, and seventy-five for the lower surface.

Now by comparing these results with the number of stomata in the leaves of other plants, we arrive at the value of the greater or less abundance of these on either surface as influencing the direction of the leaves. In 1872 I examined the leaves of the common sunflower (*Helianthus annuus*, var.) and found that the stomata of the upper surface were to those of the lower as 102 to 105. In 1874 I found after repeated observations that the stomata on a cabbage leaf were as seventy for the upper surface to eighty-six for the lower.[1] Now these numbers are so nearly like those found in *Silphium*, that we conclude that the mere number of stomata can have little if anything to do with determining polarity, for in both of these cases there is an utter want of it. I think we may then with reasonable safety throw the stomata out of the question for it is *very doubtful if they alone* have anything to do with it. The texture of the leaf must be more carefully examined than it has yet been to enable us to determine the real cause of the polarity. We know that some leaf surfaces, generally the upper — turn quickly and forcibly towards the sun, as is notably the case in the sunflower mentioned above; the cause of this heliotropism we do not know: now if we conceive a leaf with its two surfaces endowed with this sensitiveness to light, or, in other words, if both sides are equally heliotropic, the leaf will, in the struggle of the two sides for the greater share of light, be compelled to assume a position similar to that taken by the leaves of *Silphium laciniatum*; but here we need further facts. — C. E. Bessey, Ames, Iowa.

Precocity of Blossoming in the Orange. — In general it takes the orange tree, in the most favorable localities in Florida, at least five years from the sowing of the seed to produce the flowers and fruit, and

[1] Adolph Weiss records in Jahrb. für witsen. Bot. volume iv. 1865, that he found the stomata to exist in the following proportions upon the two surfaces, namely: —

Helianthus annuus, upper surface 175, under surface 325.
Brassica oleracea, " " 219, " " 301.

Which differ considerably from my proportions. However, some of his other plants are almost equally good examples for my purpose, as —

Datura stramonium, upper surface 114, under surface 189.
Chenopodium ambrosioides, " " 184, " " 156.

Morren, in Bull. de l' Academie Royale de Belgique, gives the following proportions, namely: —

Trifolium pratense, upper surface 207, under surface 335.
Helianthus annuus, " " 137, " " 242.

often this time is extended to ten years. This year, however, all over the State, numerous instances have occurred in which seedling oranges of not as many months old produced blossoms — the baby trees varying in height from one and a half to six inches. Several of these have been exhibited in Jacksonville. Of about one hundred oranges which had come up from seed planted by Judge Hayden in December, 1876, seven had a perfect flower at the top, in the following April, and when they were only an inch and a half high. These remarkable instances of premature blossoming are, I think, worthy of being recorded. — HENRY GILLMAN, Waldo, Florida.

PLANTS OF BRAZIL AND GERMANY. — Fritz Müller gives in *Flora*, an interesting account of a recent journey to the highlands of his Province, St. Catharina, and the head waters of the river Uruguay. He found many plants which reminded him, by their *facies*, of the plants of Germany. The violets, especially, were very near those of Germany. He observes that the minuter flowers of a white violet are not only cleistogamic, but are developed *under* the soil. It may be remembered that some of our Eastern species, notably V. sagittata, have late inconspicuous flowers which are very fertile. So far as we are aware, these late flowers of our violets are above and not under ground. Müller had not noticed in the lowlands any seeds or fruits which bury themselves in the ground, but on the higher plain he observed many which have marked hygroscopic properties by which they can bore their way into the soil.

CELTIS OCCIDENTALIS. — A very old specimen of this tree is growing in an exposed situation close to the shore near the Squantum Beach Hotel in the town of Quincy, Mass. Its size is worthy of record. At the ground it has a circumference of eleven feet and four inches, and at five feet from the ground, just where its short stem is the smallest, it girts seven feet. A still finer specimen stands in the city of Lowell, and this at four feet from the ground girts seven feet six inches. This is the tree of which a photograph appears in Emerson's Trees and Shrubs of Massachusetts, second edition, where it is called *Celtis crassifolia*, although in foliage and fruit it is identical with the form of *C. occidentalis* common in the Eastern States.

BOTANICAL PAPERS IN RECENT PERIODICALS. — *Bulletin of the Torrey Botanical Club.* May and June. Notes on the Botanical Geography of Syria. (An interesting account of the seven botanical regions into which Syria is divided, namely: (1.) The dunes, or hills of drifting sand. (2.) The littoral plain. (3.) The median mountain region. (4.) High Lebanon and Hermon. (5.) The high lake-bed. (6.) Valley of the Jordan and the Dead Sea. (7.) The desert.) Mr. Miller sends notes of Suffolk County notes. C. F. Austin, New Hepaticæ.

Botanical Gazette. Professor Porter gives in the July number an interesting account of some variations in mandrake, or may apple, *Podophyllum peltatum*, and Mr. Shriver has a few notes on *Nepeta* and *Draba*.

Trimen's Journal of Botany. June. W. G. Smith, A new species of *Xerotus X. sanguineus.* J. G. Baker, New Ferns from the Andes of Quito. A. W. Bennett, Review of the British species of *Polygala.* E. M. Holmes, The Cryptogamic Flora of Kent. Several extracts and excellent abstracts, together with a notice of the Botanical Garden at Copenhagen, and the titles of articles in botanical journals close the number.

Flora, No. 13. Dr. George Winter, Lichenological notices (continued in No. 14). F. v. Thümen, Notes on "Mycotheca Universalis." No. 14. Emil Godlewski. Is the product of assimilation in Musaceæ (the Banana tribe) oil or starch? (Answer, "Everything shows that the product of assimilation in the species of *Musa* and *Strelitzia* is not oil, as Briosi states, but starch, just as in other plants.") Nylander. Additions to European Lichenography (continued in No. 15). No. 15. M. Gandoger, New Roses in South Eastern France, Fritz Müller, a Letter from Brazil (noticed elsewhere).

Botanische Zeitung, No. 21. G. Kraus, The Occurrence of Inulin in other plants than Compositæ. (The writer has detected Inulin in the allied orders Campanulaceæ and Lobeliaceæ [which, by the way, have been united as tribes under one order by Bentham and Hooker], in Goodeniaceæ and Stylideæ.) No. 22. Dr. Brefeld, On the Entomophthoræ (an order of Fungi) and their allies (continued in 23). No. 23, Dr. G. Haberlandt, On the Origin of Chlorophyll Granules in the Germ-Leaves of *Phaseolus vulgaris.* No. 24, conclusion of the preceding article by Haberlandt. "I believe that I have now shown that *true* chlorophyll granules can arise, as v. Mohl pointed out, by the enveloping of starch granules with colored protoplasma." No. 25, Professor Schenk, On the Relations of Structure of Fossil Plants. Reports of Societies.

ZOÖLOGY.[1]

The Branchiæ of the Embryo Pipa. — In *Nature* for April 5, 1877, is an interesting article, author not stated, upon The Development of Batrachians without Metamorphosis. On page 492 occurs the following passage: "The young of *Pipa Americana* [the Surinam toad] come forth from the eggs laid in the cells on their mother's back, tailless and perfectly developed. In them, likewise, no one has yet detected branchiæ." Two points here made are not in accordance with the observations of the late Prof. Jeffries Wyman, as recorded in the *American Journal of Science and Arts*, 1854, second series, vol. xvii. pp. 369–374.

Wyman states that the eggs are transferred by the male to the back of the female, which presents "a uniform surface throughout;" "their presence excites increased activity in the skin, it thickens, and is gradually built up around each egg, which it at length incloses in a well-defined pouch."

[1] The departments of Ornithology and Mammalogy are conducted by Dr. Elliott Coues, U. S. A.